Report **2010-A**

ERCB

Review of Commingling from the Ardley Coal Zone in Development Entity No. 1

May 2010

Energy Resources Conservation Board

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1 Introduction

The Energy Resources Conservation Board (ERCB) committed to a review of commingled coalbed methane (CBM) production from the Ardley coals within Development Entity No. 1 (DE No. 1) when it issued *Bulletin 2006-28: Changes to the Management of Production From Two or More Pools in the Wellbore* in July 2006. This commitment was made to verify that commingling the relatively shallow Ardley coals with other deeper gas zones in DE No. 1 was having no impact on groundwater. While areas where the Ardley was believed to contain non-saline water were excluded from DE No. 1, a review was viewed as prudent following some period of commingled production under the DE process in order to verify that the boundaries of DE No. 1 were appropriate in this regard.

This review, which was completed with the participation of Alberta Environment (AENV), covers Ardley CBM development and production within DE No. 1 from its implementation on October 31, 2006, through September 30, 2009. Given the small number of commingled Ardley wells in DE No. 1 and the minimal water volumes produced, assembling an independent panel of scientific experts to support this review was not necessary.

This review has a different focus and geographical area from that in the recently published ERCB/Alberta Geological Survey (AGS) report by K. Parks and L. D. Andriashek entitled *Preliminary Investigation of Potential, Natural Hydraulic Pathways Between the Scollard and Paskapoo Formations in Alberta: Implications for Coalbed Methane Production* available on the AGS Web site www.ags.gov.ab.ca. The ERCB/AGS report evaluates potential risks of gas and water migration from water-saturated Ardley coal zones that occur west and north of DE No. 1. These two reports together add incrementally to the scientific understanding of the Ardley coal zone in Alberta.

2 Geological Overview

The Ardley coal zone (see Figure 1) is the upper member of the Scollard Formation in the Edmonton Group. It is overlain by the Paskapoo Formation and underlain by the Lower Scollard. It contains economically significant coal seams with the majority of development within DE No. 1 occurring between Townships 33 and 40.

All of the coals in the Scollard Formation are termed Ardley coals after the type section at Ardley bend, east of the City of Red Deer. A laterally extensive main or lower zone has been mapped, with occurrences of an upper zone also being present. Thus there is a need to designate both an Upper and Lower Ardley subzone. The Lower Ardley subzone is the primary Ardley CBM target in DE No. 1, as there is little to no water production associated with the Lower Ardley, and the Upper Ardley subzone is often not present due to erosion by the overlying Paskapoo Formation. Where the Upper Ardley is present, it is often a non-saline aquifer in the thicker coals found in this area.

Outside the northwest boundary of DE No. 1, the Ardley coals are thicker and deeper and have been the focus of CBM development on a standalone basis due to higher gas contents and the relative lack of coal in other horizons in this area. The Ardley coals within DE No. 1 are generally thinner and have lower gas contents, resulting in the need to commingle CBM production from the Ardley coals with other coals and sandstones in order for its development to be economic.

While all of the Ardley coals in Alberta occur above the base of groundwater protection (BGWP), production from the Lower Ardley in DE No. 1 has shown that there is little or no water production associated with this Ardley subzone in this area and that the production

performance to date of the Ardley zone in DE No. 1 is similar to coals in the Horseshoe Canyon Formation.

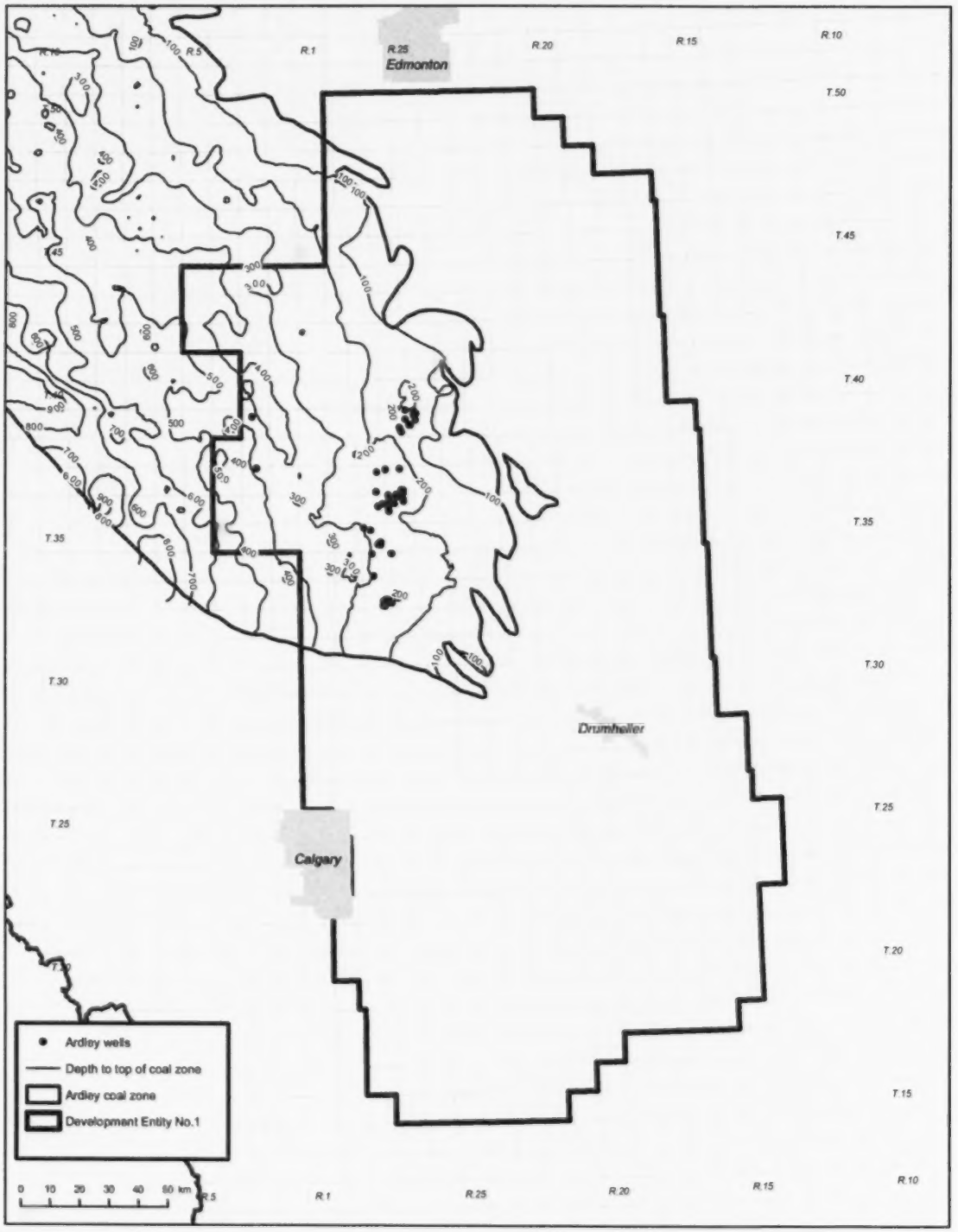

Figure 1. Ardley development

3 Review of Ardley Commingling and Production

As of September 30, 2009, there were 54 wells with commingled completions in the Ardley zone in DE No. 1 (see Table 1). The following points provide an overview of the Ardley development in DE No. 1:

- Water production has been recorded at 38 wells, with the highest cumulative water production for any well during the reporting period being 23.7 cubic metres (m^3). Water production has not been high enough, 5 m^3/month or greater, from any of the 38 wells to trigger a review of the well in accordance with *ERCB Directive 044: Requirements for the Surveillance, Sampling, and Analysis of Water Production in Oil and Gas Wells Completed Above the Base of Groundwater Protection (BGWP).*

- The small volumes of water produced from the 54 wells in DE No. 1 confirm that the Ardley zone is not water saturated in the wells completed in the Ardley and suggest that the Ardley zone is not a groundwater aquifer in the area of DE No. 1.

- All of the wells were completed in a commingled manner with other deeper zones, either the Horseshoe Canyon coals or a combination of Horseshoe Canyon coals and Edmonton/Belly River sand zones.

- The DE No. 1 code was used by industry on 22 wells, meaning that the licensees of these wells determined that the wells qualified for unsegregated multizone (commingled) production and proceeded accordingly. Subsequent auditing of these wells by the ERCB has confirmed the appropriate use of the DE No. 1 code. The remaining 32 wells were either already on ERCB-approved commingled production prior to the DE No. 1 implementation or the wells had not yet commenced production as of September 30, 2009.

Table 1. Wells with Ardley completions in DE No. 1 and water production

Unique Well Identifier	Well status as of Sep. 30, 2009	Total water production (m^3) Nov. 1, 2006, to Sep. 30, 2009
00/08-32-034-27W4/0	CBMOT FLOW - Nov 08*	23.7
00/08-04-040-26W4/0	CBMOT FLOW - Nov 04	19.3
00/06-18-039-25W4/0	CBMCLS FLOW - Nov 05**	18.1
00/16-34-039-26W4/0	CBMOT FLOW - Nov 07	17.1
00/08-18-039-25W4/0	CBMOT FLOW - Nov 05	16.6
02/06-32-039-25W4/0	CBMOT FLOW - Dec 06	14.6
00/08-11-039-26W4/0	CBMOT FLOW - Aug 07	13.8
00/14-11-039-26W4/0	CBMCLS FLOW - Feb 08	11.4
00/08-18-036-26W4/0	CBMCLS FLOW - Jun 05	11.1
00/05-34-037-26W4/0	CBMCLS FLOW - Nov 04	9.5
00/06-33-036-26W4/0	CBMOT FLOW - May 05	9.4
02/08-11-035-27W4/0	CBMOT FLOW - Nov 08	8.7
00/16-20-036-26W4/0	CBMOT FLOW - May 05	8.0
00/16-30-036-26W4/0	GAS FLOW - May 05	7.6
00/08-36-034-27W4/0	CBMCLS FLOW - Mar 07	7.4
00/06-29-039-25W4/0	CBMOT FLOW - Jul 05	7.0
02/16-03-037-26W4/0	CBMOT FLOW - Jun 05	7.0
02/08-27-036-26W4/0	CBMCLS FLOW - May 05	6.9
00/14-24-036-27W4/0	CBMOT FLOW - May 05	6.8
02/08-03-037-26W4/0	CBMOT FLOW - Jun 05	6.5

(continued)

Unique Well Identifier	Well status as of Sep. 30, 2009	Total water production (m^3) Nov. 1, 2006, to Sep. 30, 2009
00/06-11-035-27W4/4	CBMOT FLOW - Jul 04	6.5
00/16-02-039-26W4/2	CBMOT FLOW - Dec 07	6.3
00/16-11-035-27W4/0	CBMOT FLOW - Nov 08	6.3
02/11-02-037-27W4/0	CBMCLS FLOW - Nov 06	6.1
00/14-29-035-27W4/0	CBMCLS FLOW - Nov 08	5.1
00/14-29-039-25W4/0	CBMOT FLOW - Jul 05	4.9
00/16-31-036-26W4/0	CBMOT FLOW - Jul 08	4.5
00/16-18-036-26W4/0	CBMOT FLOW - May 05	4.4
00/08-20-039-25W4/3	CBMOT FLOW - Jul 05	4.4
02/14-03-037-26W4/0	CBMOT FLOW - Jun 05	4.1
00/08-28-035-27W4/0	CBMCLS FLOW - Nov 08	3.9
00/14-11-035-27W4/0	CBMOT FLOW - Nov 08	3.7
00/14-33-036-26W4/0	CBMOT FLOW - Jun 05	3.6
00/16-27-036-26W4/0	CBMOT FLOW - May 05	3.5
00/07-23-036-27W4/0	CBMOT FLOW - Sep 08	3.3
00/16-29-039-25W4/0	CBMOT FLOW - Jul 05	3.3
00/10-24-039-26W4/0	CBMCLS FLOW - May 06	3.3
00/09-36-039-26W4/2	CBMOT FLOW - Feb 07	3.2
00/08-30-036-26W4/0	CBMOT FLOW - May 05	0.0
00/10-02-033-27W4/0	CBMOT FLOW - Dec 07	0.0
00/12-02-033-27W4/0	CBMOT FLOW - Dec 07	0.0
02/11-11-033-27W4/2	CBMCLS FLOW - Dec 07	0.0
00/16-11-033-27W4/0	CBMCLS FLOW - Dec 07	0.0
00/01-12-033-27W4/0	CBMCLS FLOW - Dec 07	0.0
00/14-12-033-27W4/0	CBMOT FLOW - Dec 07	0.0
00/04-31-037-26W4/0	CBMOT FLOW - Aug 08	0.0
00/13-04-034-27W4/0	CBMCLS TSTCMP - Feb 07	0.0
02/12-34-037-03W5/0	GAS SUSP - Aug 05	0.0
00/04-11-034-28W4/0	DRL&C - Nov 05	0.0
00/05-18-034-28W4/0	DRL&C - Sep 05	0.0
00/13-12-034-29W4/0	DRL&C - Aug 04	0.0
00/16-20-036-01W5/0	DRL&C - Mar 07	0.0
00/11-26-037-27W4/0	DRL&C - Sep 07	0.0
00/08-20-035-27W4/0	DRL&C - Aug 08	0.0

Source: *Directive 062: Coalbed Methane Control Well Requirements and Related Matters.*
* CBMOT is defined as coalbed methane and other lithologies for fluid flow.
** CBMCLS is defined as coalbed methane only fluid flow.

4 Conclusions

There has been limited development of the Ardley zone in DE No. 1 since the DE was created on October 31, 2006. The volume of water produced from the Ardley coals in DE No. 1 has been minimal, suggesting that the Lower Ardley coal zone is not a groundwater aquifer in this area and that the initial outline of DE No. 1 was appropriate, in that it did not include areas in which the Ardley contains significant water. It then follows that the inclusion of the Ardley in DE No. 1, which allows the zone to be produced in a commingled manner with other zones in the DE, has not impacted groundwater resources in the Ardley coals.

Although the Ardley coals are always above the designated BGWP, the coals do not appear to contain free water within the DE No. 1 boundary. This is supported by production data from the Ardley zone to date in DE No. 1 and can likely be attributed to a number of factors,

including the BGWP being purposely conservative in order to protect non-saline groundwater and the burial history of the Ardley, resulting in underpressured dry coals within DE No. 1.

Increased surveillance of water production from all oil and gas wells producing from zones above the BGWP was put in place in 2006 as a result of *Directive 044*. This further mitigates the risk of production from the Ardley coals in either a segregated or commingled manner having any impact on groundwater resources. When combined with other controls and restrictions on the production of non-saline water in Alberta, the potential for unapproved non-saline water production from the Ardley or any other coal zone is minimal. The ongoing surveillance of shallow water production from oil and gas wells will ensure that the continued production from the Ardley zone and its inclusion in DE No. 1 do not result in unintended consequences. Any water production from coals will be detected through *Directive 044* surveillance and the appropriate actions taken by the ERCB and AENV to ensure that non-saline groundwater and aquifers are protected.